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Title: SEMICONDUCTOR DEVICE AND METHOD FOR MANUFACTURING SAME
Inventor(s): Tatsuya USAMI et al.
DOCKET NO.: 029437-0103

FIG. 1

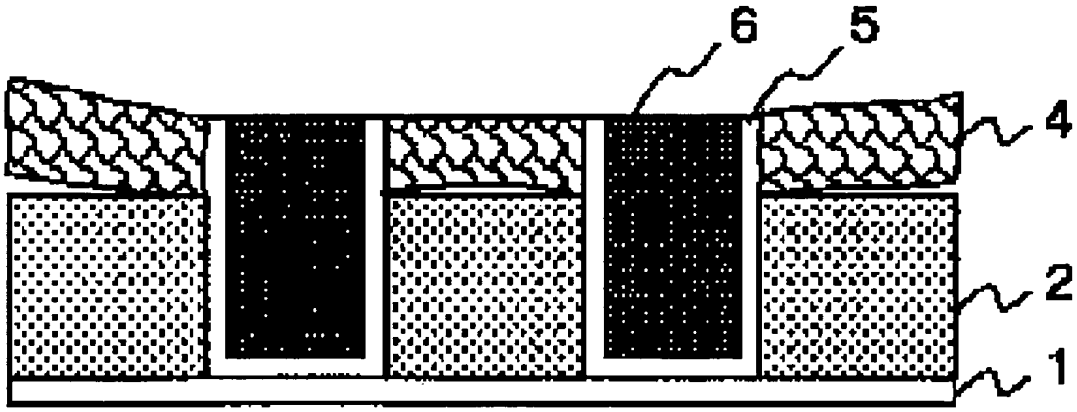

FIG. 2

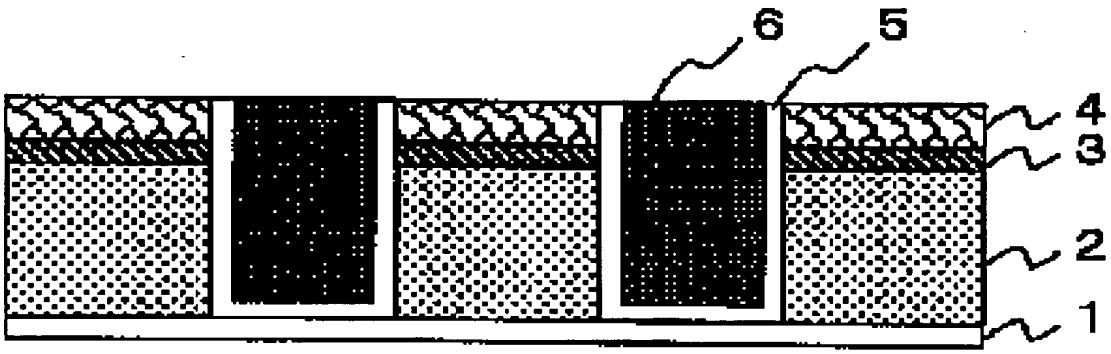

FIG. 3

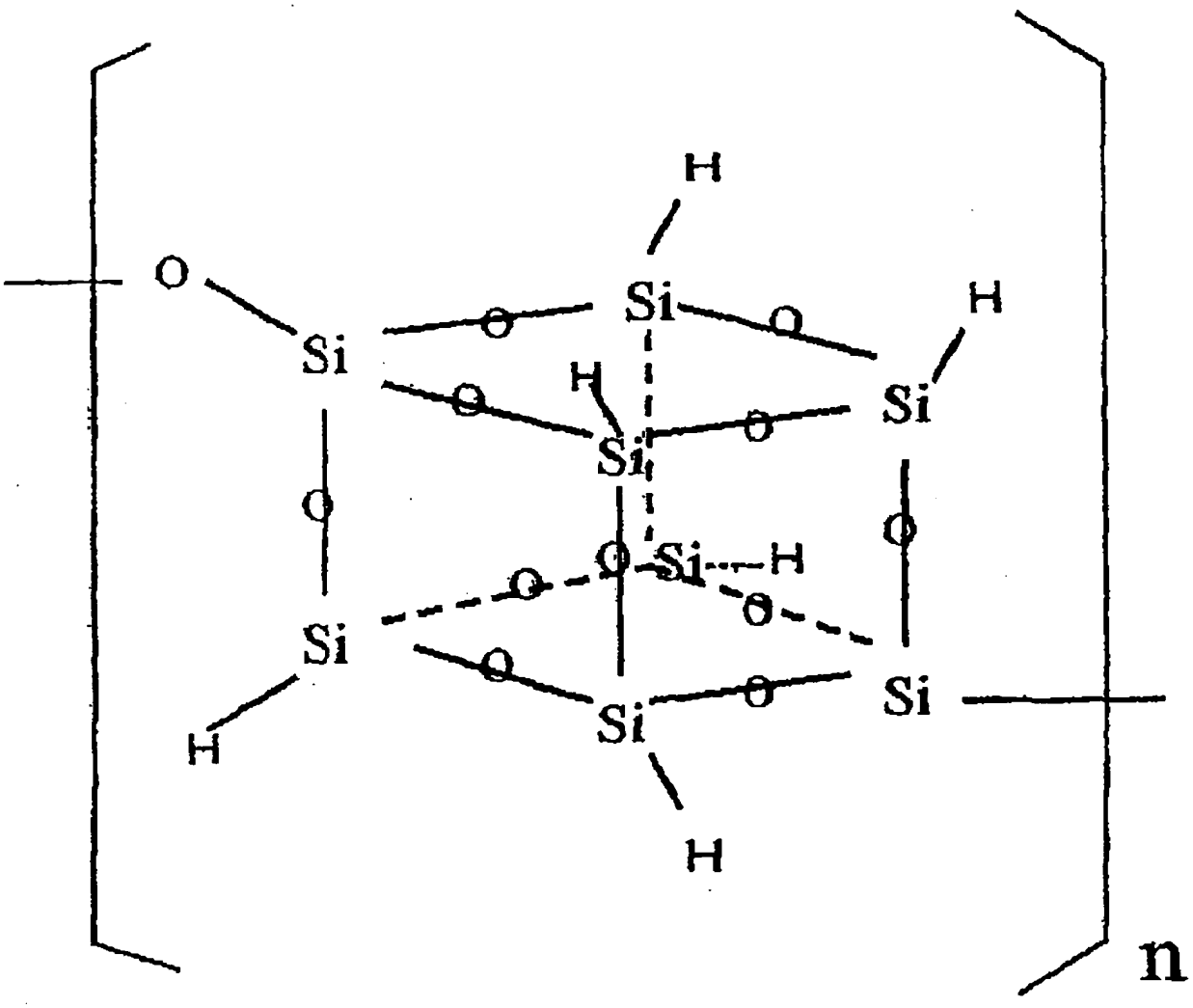

FIG. 4

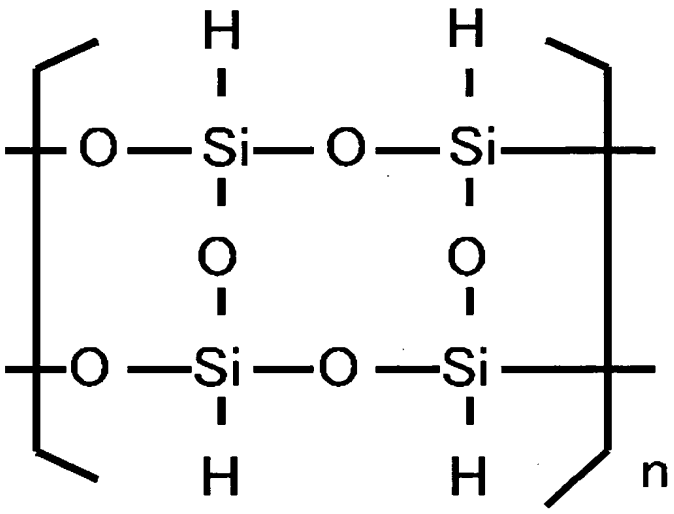

FIG. 5

DIELECTRIC CONSTANT (at 1 MHz)	2.9
REFRACTIVE INDEX (at 633 nm)	1.39
STRESS (dyne/cm^2)	7.00 X 10^8
HARDNESS (GPa)	0.9
ELASTICITY (GPa)	6
THERMAL EXPANSION COEFFICIENT (ppm/deg-C)	18
GLASS TRANSITION TEMPERATURE (deg-C)	NA
THERMAL CONDUCTIVITY (W/mK, at 25 deg-C)	0.31

FIG. 6

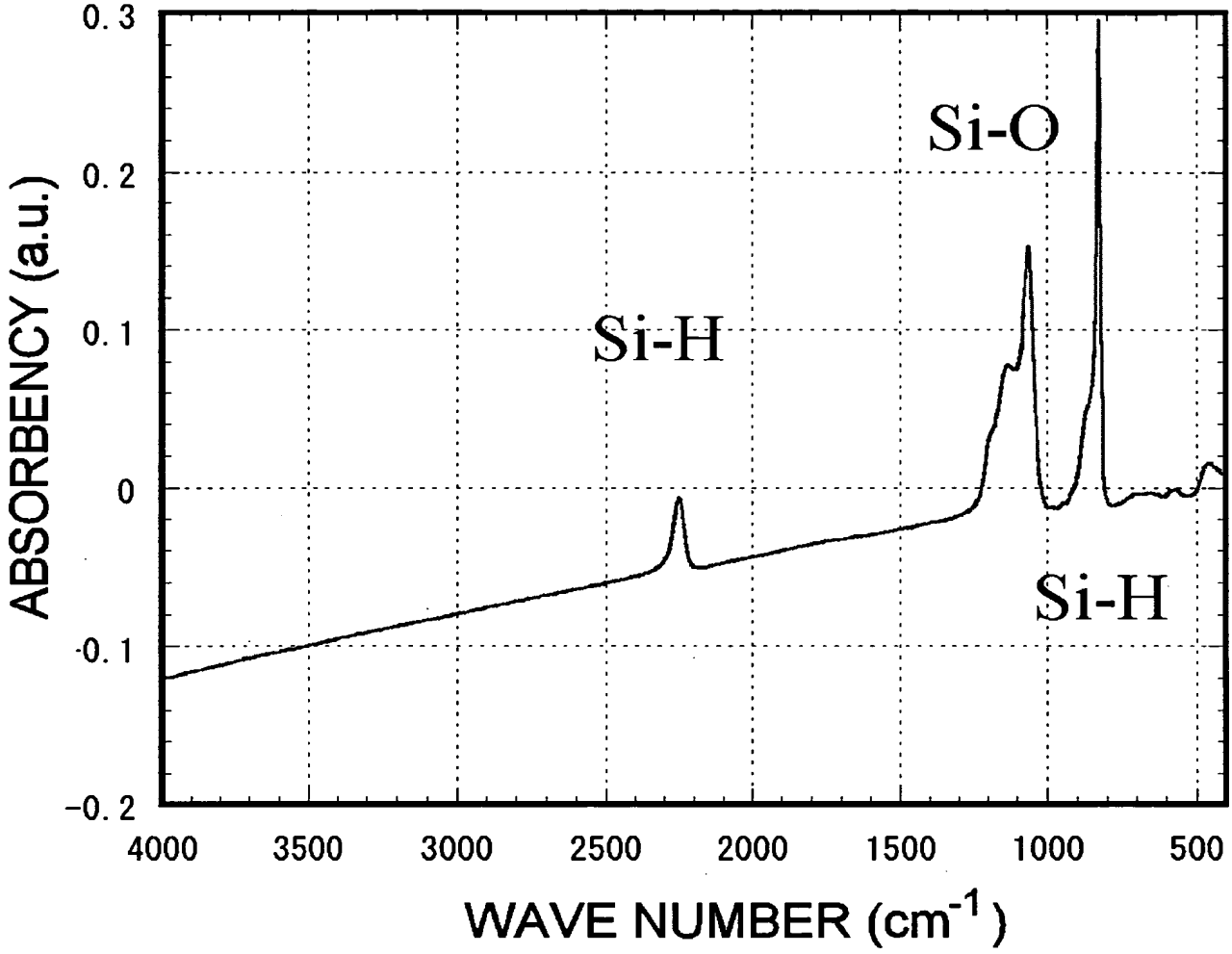
0.3
0.2
0.1
0
-0.1
-0.2
ABSORBENCY (a.u.)
Si-O
Si-H
Si-H
4000
3500
3000
2500
2000
1500
1000
500
WAVE NUMBER (cm-1)

FIG. 7

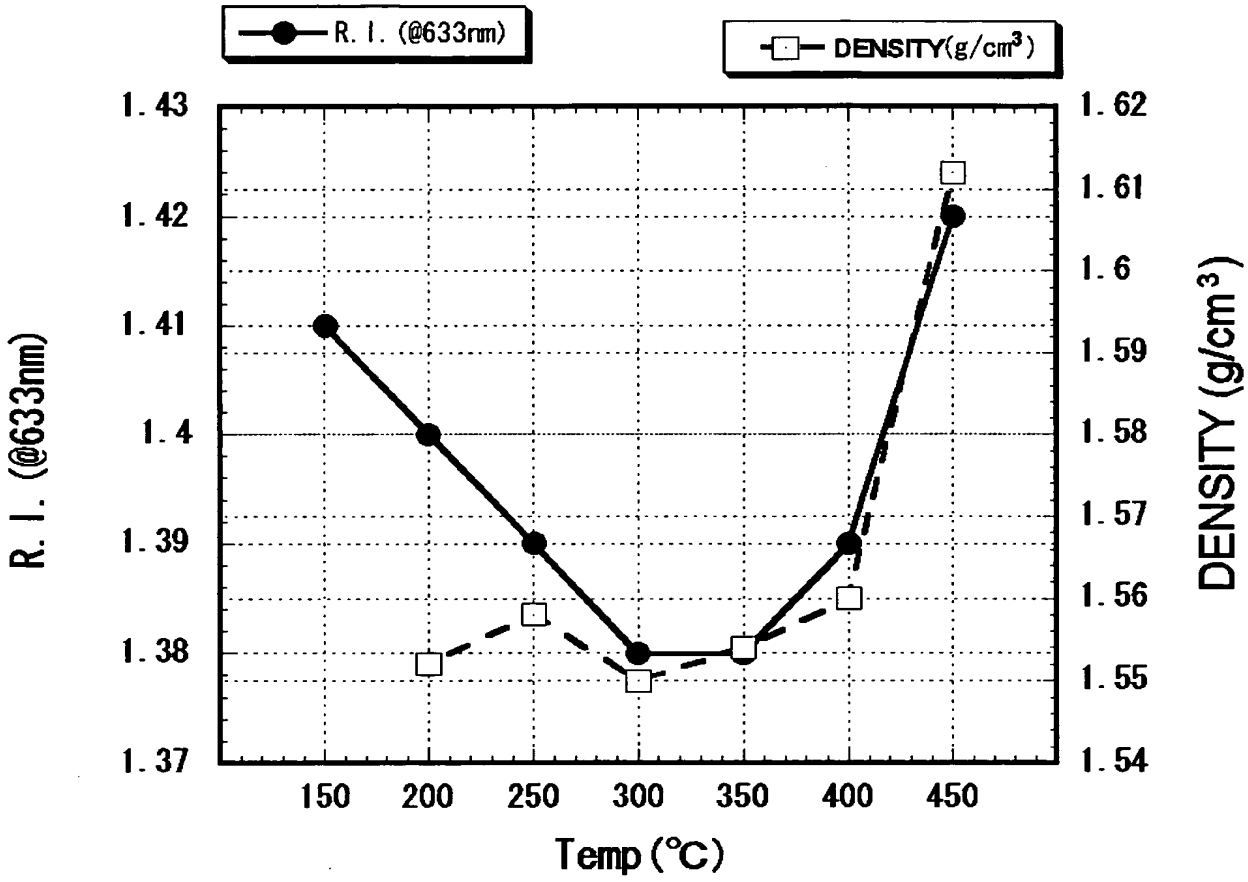
R. I. (@633nm)
DENSITY(g/cm³)
1.43
1.42
1.41
1.4
1.39
1.38
1.37
R. I. (@633nm)
1.62
1.61
1.6
1.59
1.58
1.57
1.56
1.55
1.54
DENSITY (g/cm³)
150
200
250
300
350
400
450
Temp (°C)

FIG. 8A

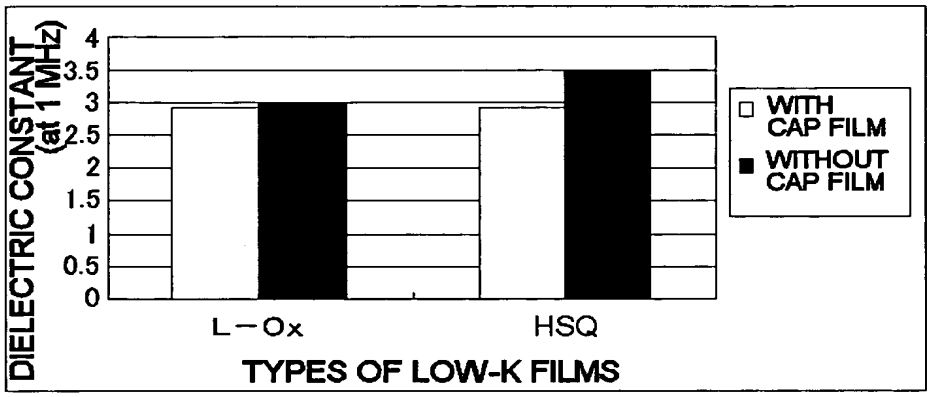

FIG.8B

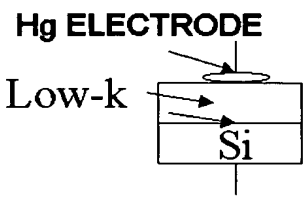

FIG.8C

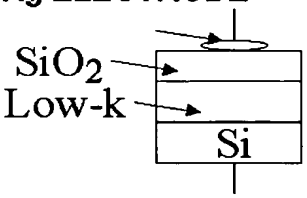

FIG.9A

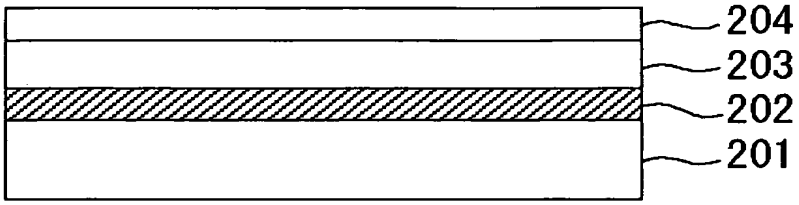

FIG.9B

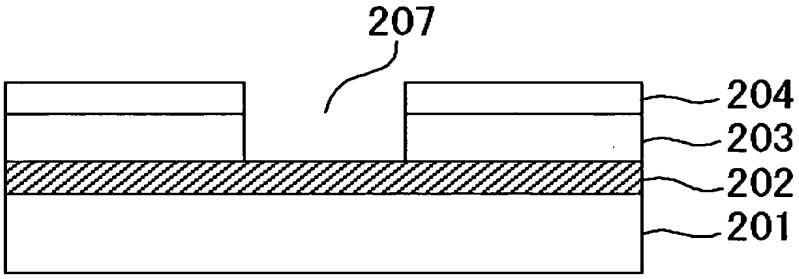

FIG.9C

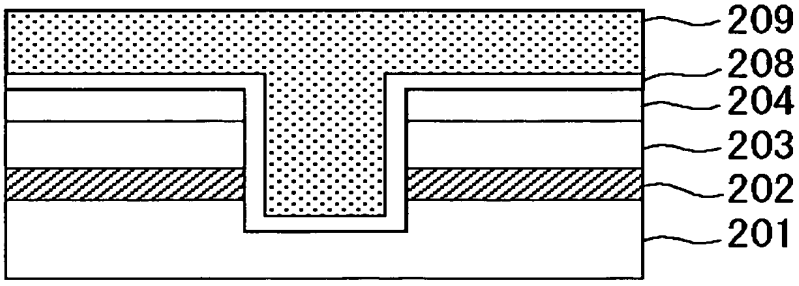

FIG.9D

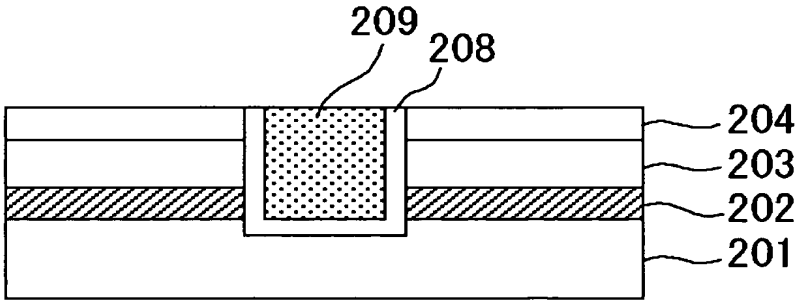

FIG.10

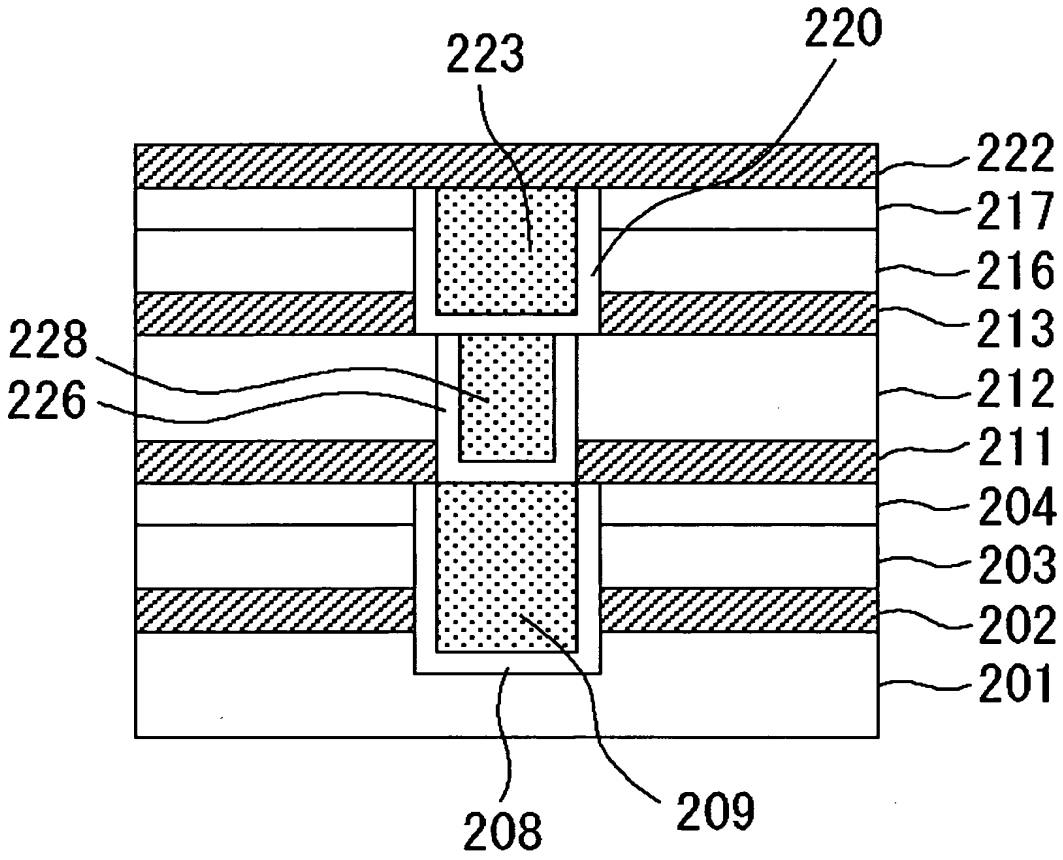

FIG.11A

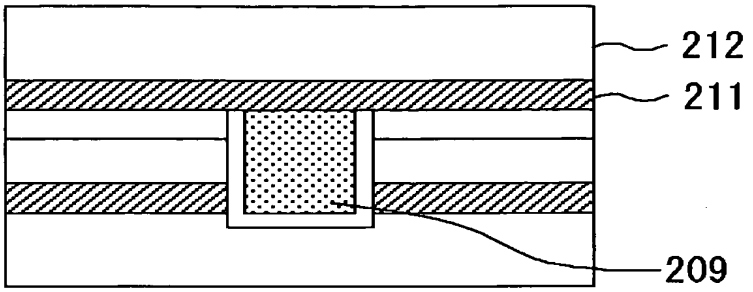

FIG.11B

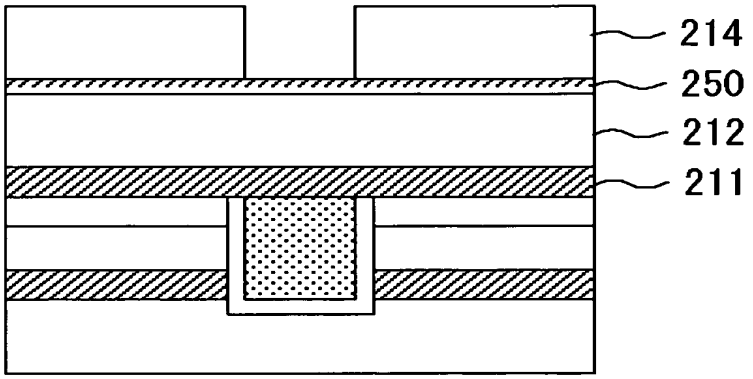

FIG.11C

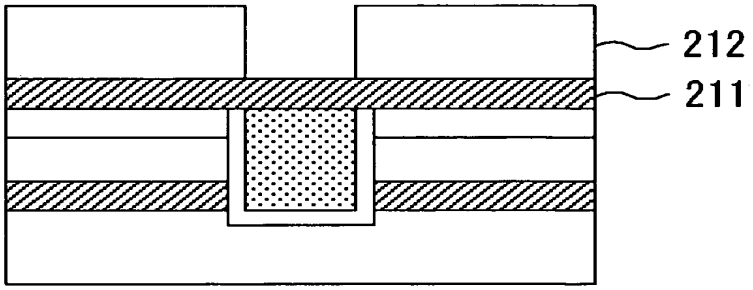

FIG.11D

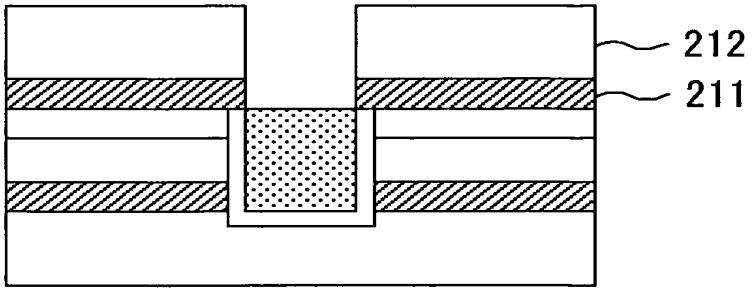

FIG.12E

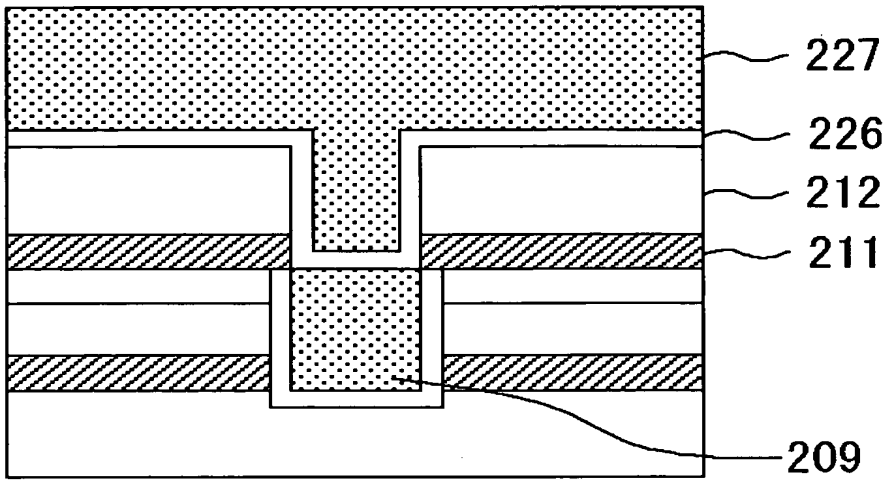

FIG.12F

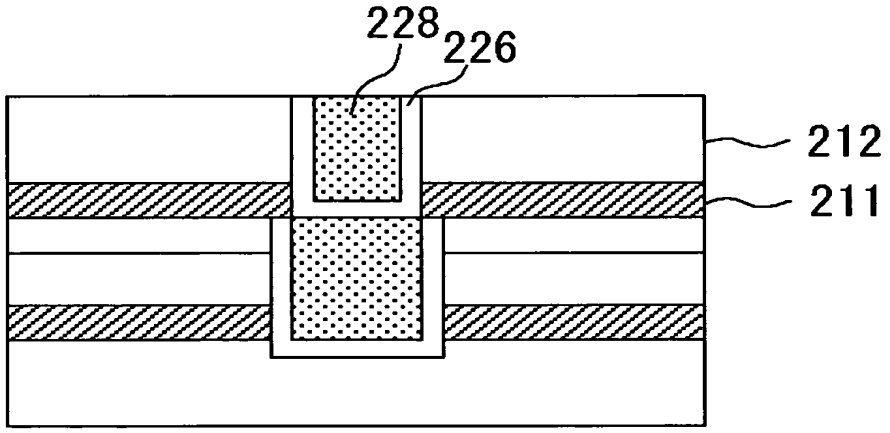

FIG.12G

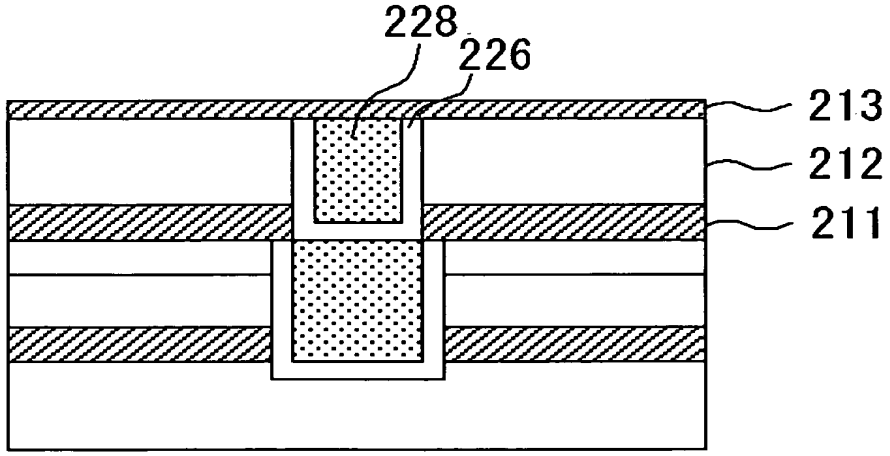

FIG.13H

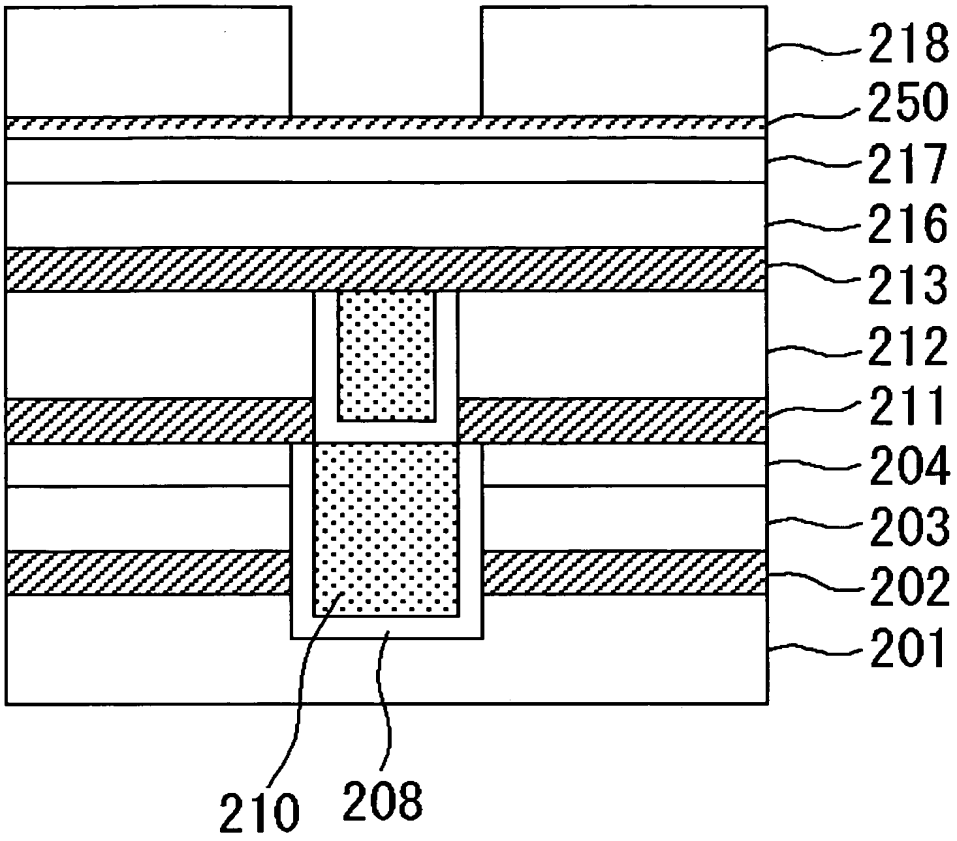

FIG.13I

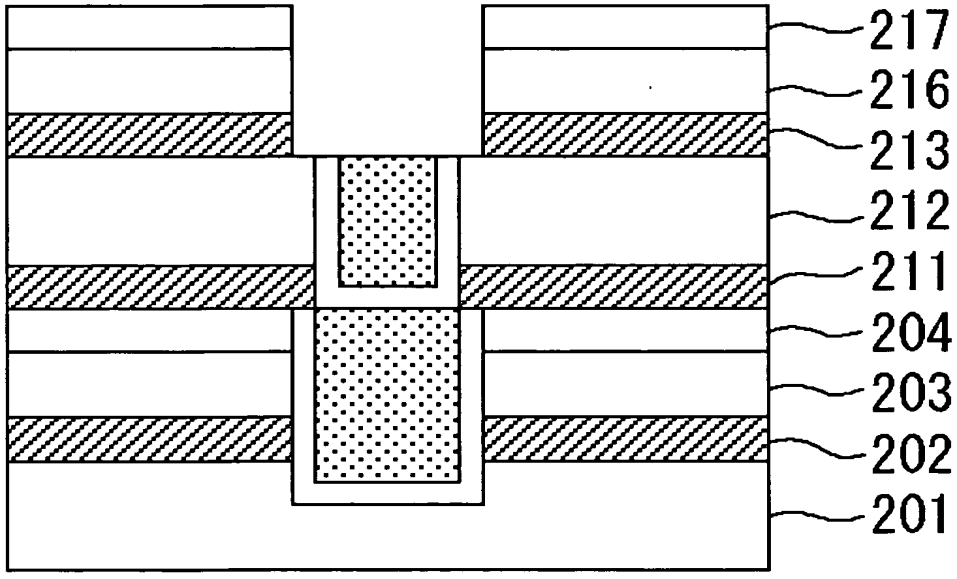

FIG.14J

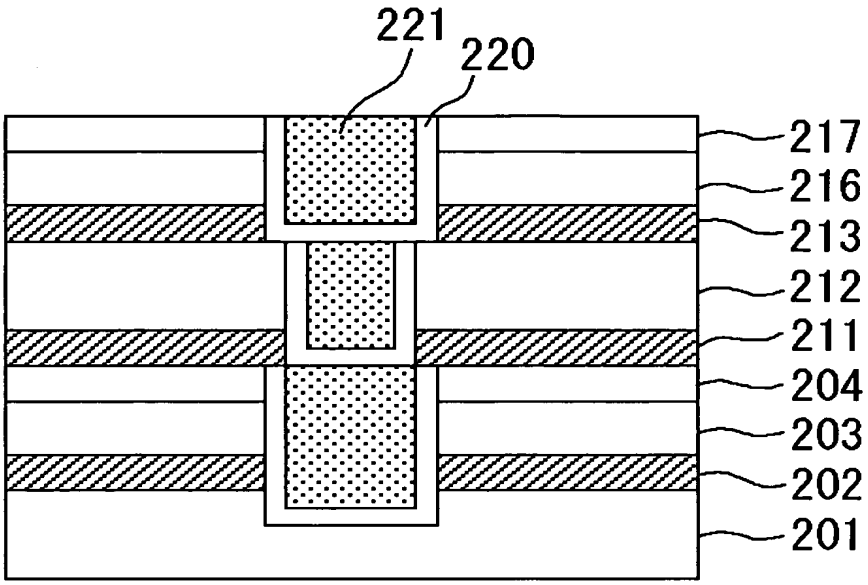

FIG.14K

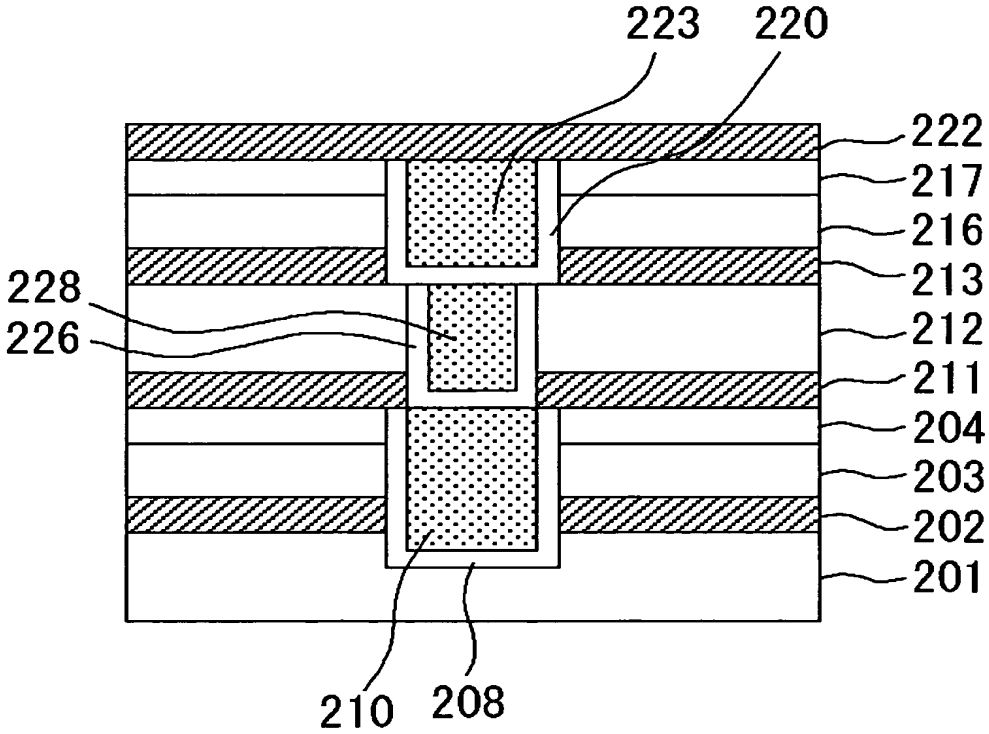

FIG.15

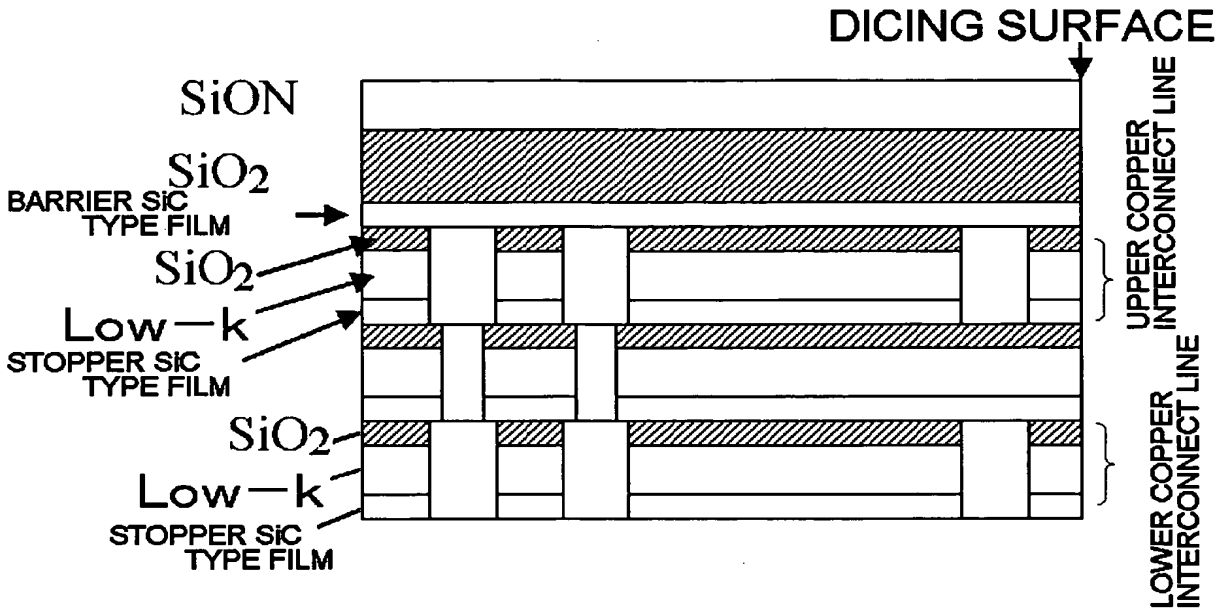
DICING SURFACE
SiON
SiO2
BARRIER SiC TYPE FILM
SiO2
Low−k
STOPPER SiC TYPE FILM
SiO2
Low−k
STOPPER SiC TYPE FILM
UPPER COPPER INTERCONNECT LINE
LOWER COPPER INTERCONNECT LINE

FIG.16

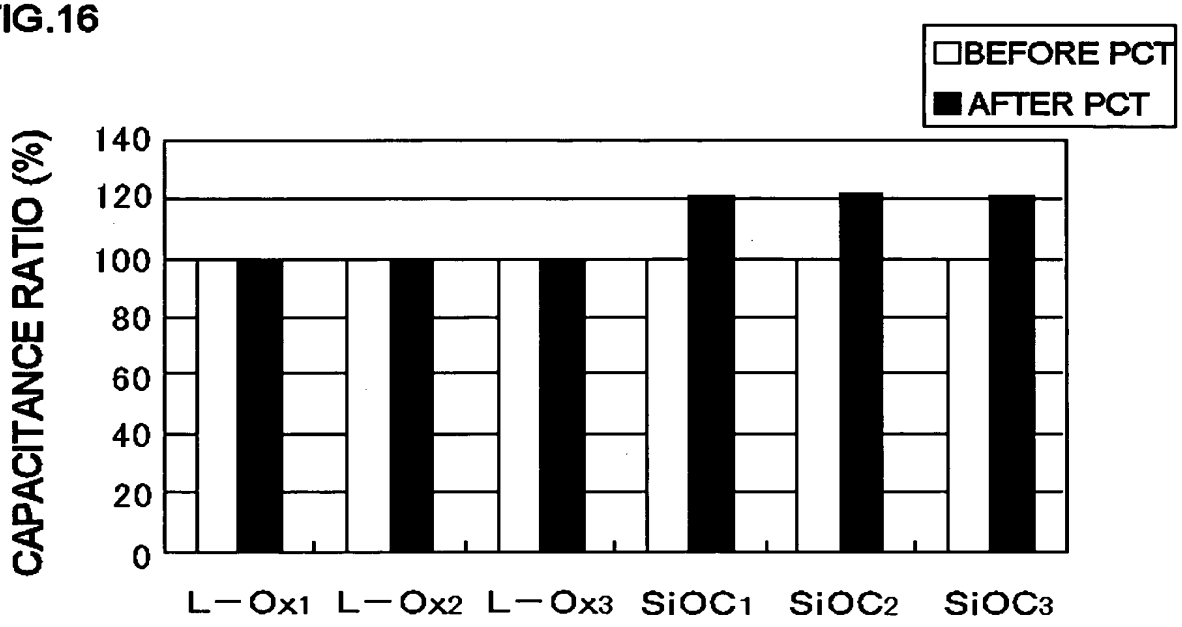
□BEFORE PCT
■AFTER PCT
CAPACITANCE RATIO (%)
140
120
100
80
60
40
20
0
L−Ox1
L−Ox2
L−Ox3
SiOC1
SiOC2
SiOC3

FIG. 17

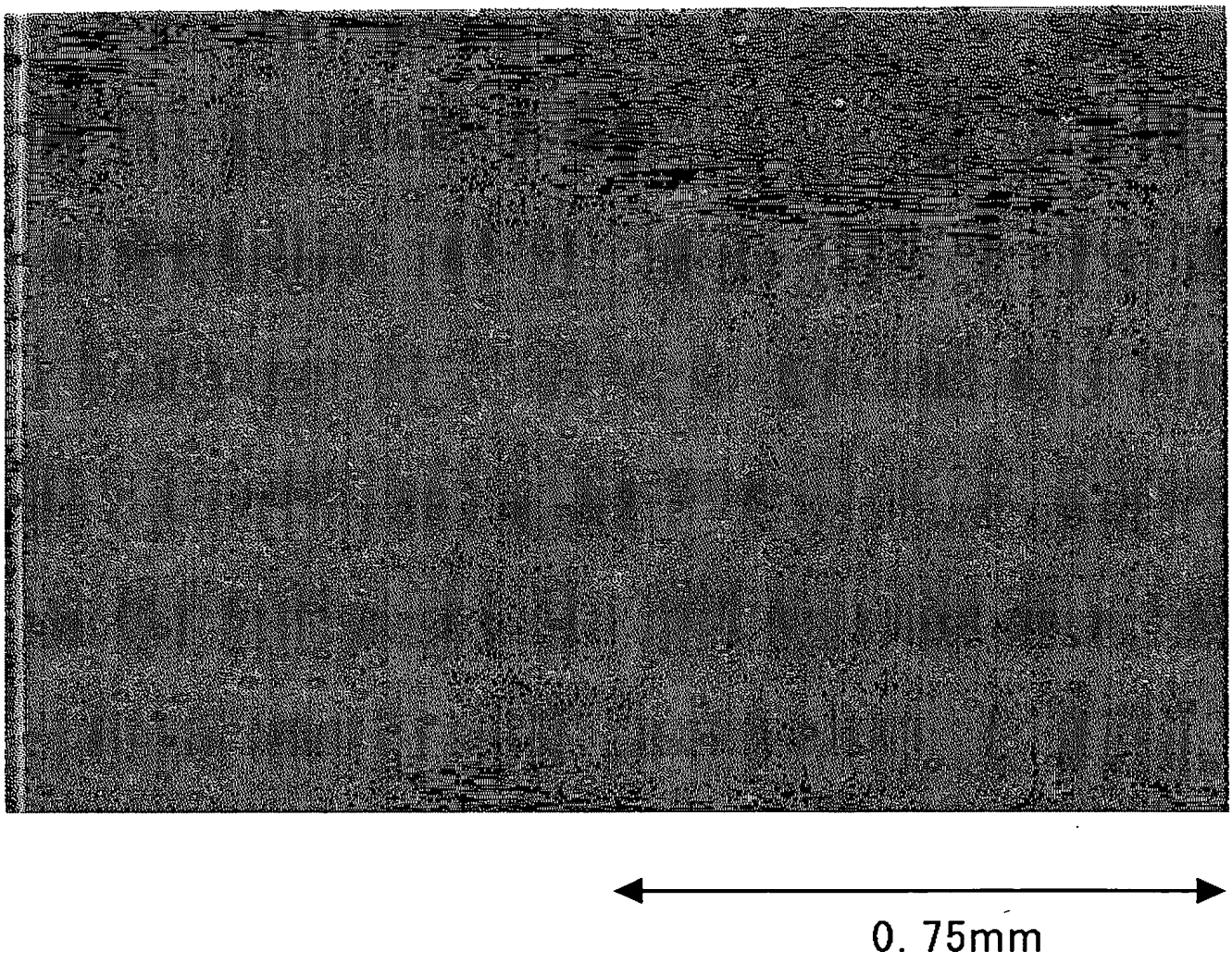

FIG. 18A

	UPPER FILM			
	SiO_2 (i)	SiO_2 (ii)	SiCN	SiCN (CMP)
SiOC	×	×	○	○
POLYPHENYLENE	×	NO DATA	○	○
L−Ox™	○	NO DATA	○	○
POROUS L-Ox™	○	NO DATA	○	○
SiO_2	NO DATA	NO DATA	○	○

FIG. 18B

	LOWER FILM
	SiCN
SiOC	×
POLYPHENYLENE	×
L−Ox™	○
POROUS L-Ox™	○
SiO_2	○